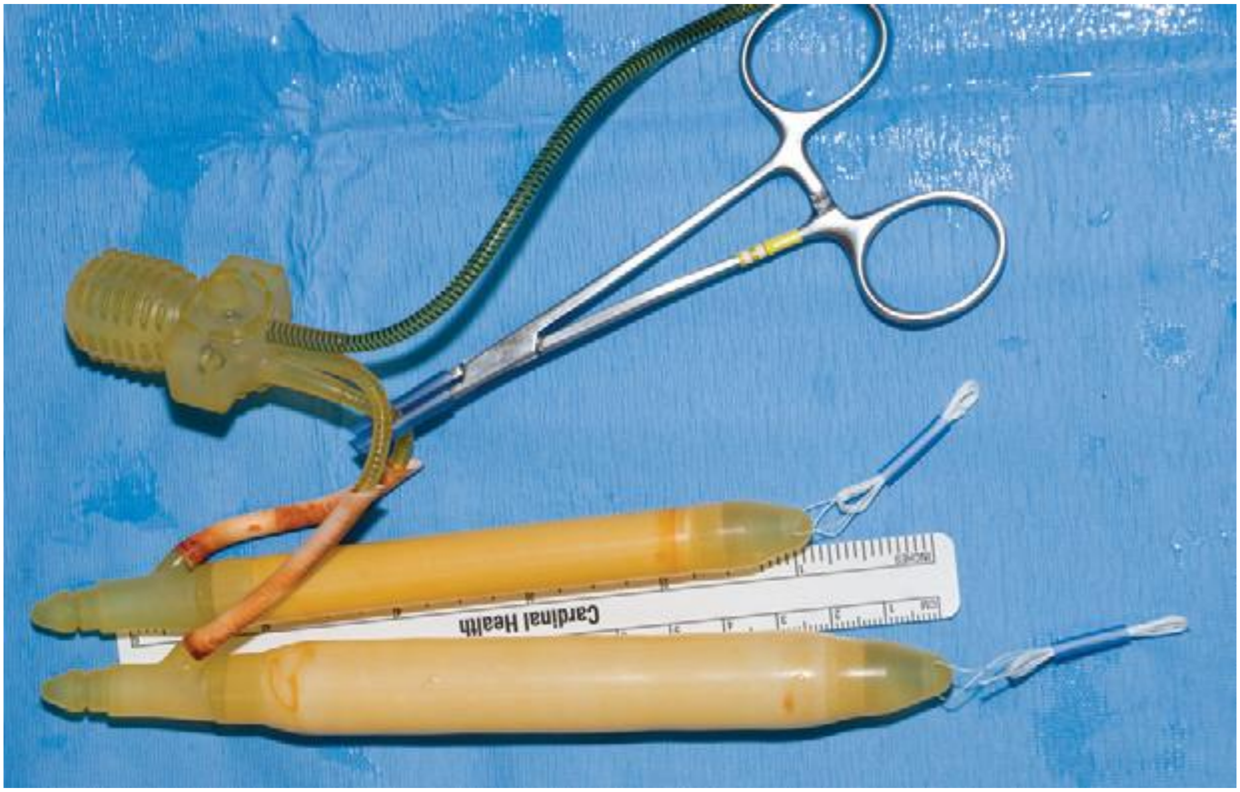
Penile Prosthetics for ED

TYPES OF PROSTHESES

- malleable/semi-rigid
- 2-piece inflatable
- 3-piece inflatable



1- Malleable penile prothesis

ADVANTAGE

- low mechanical failure rate
- easier placement
- easier use
- more rigid cylinder

DISADVANTAGE

- not physiologic
- increased risk of cylinder erosion

- inability to change girth

2- Inflatable penile prosthesis

Advantages

- physiologic
- concealable

Disadvantages

- higher rates of mechanical failure
- harder to place
- harder to use (arthritis, etc)

indications for penile prosthesis implantation for ED?

- refractory to non-surgical therapy or severe scarring (trauma, prior implant, priapism)
- contraindications to non-surgical medications
- severe veno-occlusive dysfunction with concomitant severe Peyronie's disease

contraindications to a penile prosthesis for ED

- **C**oagulopathy (uncontrolled)
- **I**nfection (active)
- **DM** (uncontrolled)
- **P**oor surgical risk

pre-op counseling prior to implantation of a penile prosthetic device

☐ ideal to have partner present

- inform pt of alternative options } vacuum device, ICI, etc
- discuss various types of penile prosthetic devices } malleable vs inflatable
- discuss expectations of surgery } glans doesn't enlarge, erections usually shorter than N
  } does not increase orgasm or ejaculation
- post-op management } pain meds for ~ 1wk, no sex for 4-6 wks,
- discuss complications } infection, mechanical failure, irreversible changes

SURGICAL APPROACHES

surgical approaches taken for penile prosthetic implantation

1) subcoronal } only for malleable or positional devices
2) infrapubic
3) penoscrotal

Infrapubic approach

Advantages

- reservoir placed under direct vision

Disadvantages

- limited corporeal exposure
- possible dorsal nerve injury
- inability to anchor pump

Penoscrotal approach

Advantages

- better corporeal exposure especially if corporeal fibrosis significant
- no dorsal nerve injury
- pump fixation possible

Disadvantages

- blind reservoir placement
- potential excess tubing present in scrotum or base of penis

main points of an inflatable penile prosthesis implantation.

 exposure

- patient in supine position under GA or spinal
- 4cm transverse incision made ~1cm below penoscrotal junction
- transverse incision carried down through dartos fascia } towards urethra & corporeal bodies NOT towards scrotum
- underside of dartos fascia dissected off urethra and proximal crura

- ring rectractor placed

☐ placement of cylinders

- 2cm corporotomies made w/ placement of 2 horizontal mattress sutures on each side
- dilation starts with 8mm Hegar dilators } proceeds to 16mm proximally and 14mm distally
- sizing instrument used to measure distal and proximal ends
    - ☐ 2cm corporotomy not included in total length } eg 9cm + 11cm = 20cm device
    - ☐ there are standard sizes } adjustments made by addition of rear tip extenders
- cylinders filled with NS until full but not under pressure
- pump filled with NS
- reservoir filled with NS to remove air, then NS is removed
- distal cylinder inserted with aid of Furlow inserter
- rear tip extenders added PRN then proximal portion is inserted manually

☐ proper placement = proximal end all the way to attachment of crus to pelvic bone + distal end under midglans + flatly lying cylinder w/in corporal bodies

- corporotomies closed by tying horizontal stay sutures } proximal sutures closed first

☐ placement of pump

- 2nd incision made through dartos fascia in scrotal septum
- pump placed in deep septal pouch within scrotum
- each of the 3 pump tubes are routed through back wall of pouch
- pump tubes connected to each cylinder
- 2nd dartos incision closed

☐ placement of reservoir

- pubis to glans tip measured with cylinders in flaccid and inflated positions
- bladder emptied by placement of Foley
- reservoir placed into retropubic space through primary penoscrotal incision
- transversalis fascia perforated in floor of external inguinal ring just above pubic tubercle on either side

☐ correct placement confirmed by feeling back of pubis and balloon in bladder

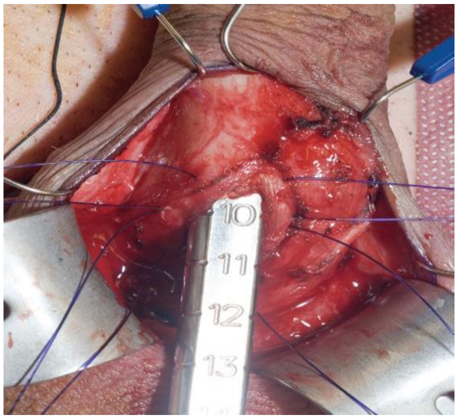
- empty reservoir introduced in retropubic space

☐ 65cc reservoir for all devices except for 18cm & 21cm cylinders (100cc reservoir)

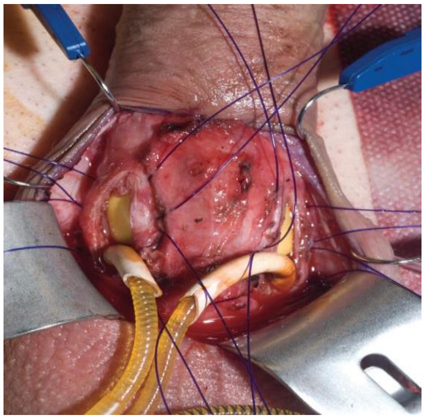
- reservoir filled and should confirm pressure in reservoir is zero even with S/P pressure . To achieve zero pressure, a 50-mL syringe without a plunger is attached to the reservoir tubing and held at the bladder (reservoir) level. Manual suprapubic pressure is then applied, allowing fluid to escape from the reservoir (Fig. 23-22). This maneuver should leave 50 to 55 mL in a 65-mL reservoir and 80 to 85 mL in a 100-mL reservoir.

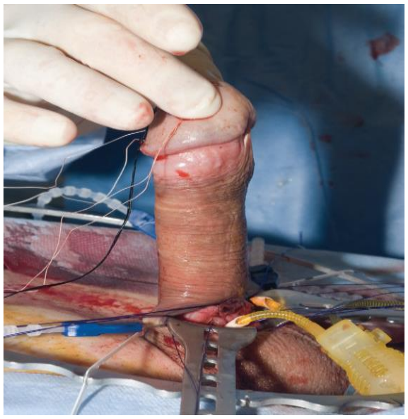
 back pressure test to prevent autoinflation

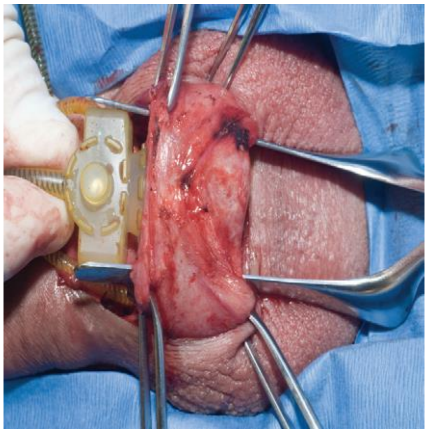
- 3rd pump tube connection made between reservoir and pump
- placement of JP drain
- dartos fascia closed transversely
- skin closed with subcuticular 4-0 vicryl

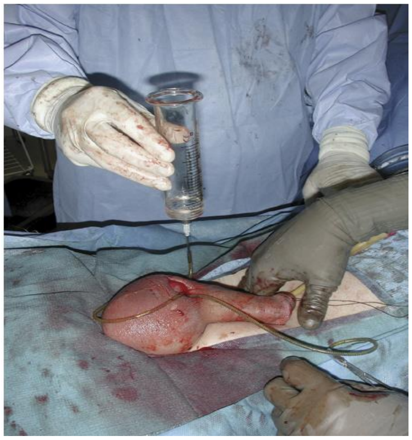


The distal measurement is 10 cm









POST-OP CARE

- remove Foley and JP drain next morning
- keep penis up against lower abdomen
- continue po Keflex x 1wk
- oral pain meds
- no heavy lifting for 4-6 wks if reservoir placed } don’t want displacement into inguinal area
- cylinder cycling can begin in 4-6 wks } inflate and deflat BID for 1 month
- can have sex once inflation can be accomplished without pain
   - can initially get failure to reach orgasm

COMPLICATIONS

- Over-sized cylinder/rod
- Mechanical failure
- Auto-inflation
- Infection
- Migration of pump
- Erosion
- Deformity (SST)
- Perforation

1) perforation } can occur during dilation of proximal corpora (crura)

    usually occurs proximally & medially near attachment to pelvic bone

   } can also occur during dilation of distal corpora

    can cross over to other side or even perforate the urethra

   Rx proximal/crura perforation

   - use larger dilator to dilate correct track
   - insert cylinder into correct track & allow perforation to heal
   - rarely will need “wind sock correction”

    distal perforation

- perforation into urethra = stop and place Foley x 7-10days
- perforation on “virgin” 1st side = stop and reschedule
- perforation on 1st side with hx of previous perf/scarring = stop + repair perforation + S/P vesicostomy or PU
- perforation on 2nd side = stop and leave only 1 OR can place both

2) erosion } occurs post-operatively

} can have erosion out through cavernosum or into urethra (more common for malleable prostheses and in men with SCI)

Rx through lateral cavernosum

- fold back cylinder and make incision in back wall of capsule, proximal to erosion site
- dilation of true corpus cavernosum followed by insertion of distal cylinder with Furlow inserter

 through urethra

- if malleable, only eroded side removed + Foley x 10 days
- if inflatable, remove eroded cylinder ASAP + plug tubing
- second rod may not be necessary for sex

3) infection } most significant complication b/c removal of all components is usually req’d

 1-3% for 1st time prostheses

 5-20% after revision surgery (if only failed component removed)

} **early (1-3wks) usually gram –ve**

 usually swelling, erythema, tenderness, pus, fever

} **late (6-24months) usually gram +ve (*S. epidermidis* is most common**)

 more common after malfunction/leak

 usually just persistent or recurrent long-term pain with skin adherent to pump

} erosion of a component means entire device is infected

} may be slightly more common in DM, SCI, and with infrapubic approach

Rx □ can give trial of Abx but usually need removal of entire device

□ corporeal smooth muscle fibrosis makes reimplantation of cylinder difficult

□ expedient device reimplantation now recommended (2-3 months)

□ "salvage" procedure also an option (remove, irrigate, reinsert new, Abx)

ways to reduce of infection of penile prosthesis

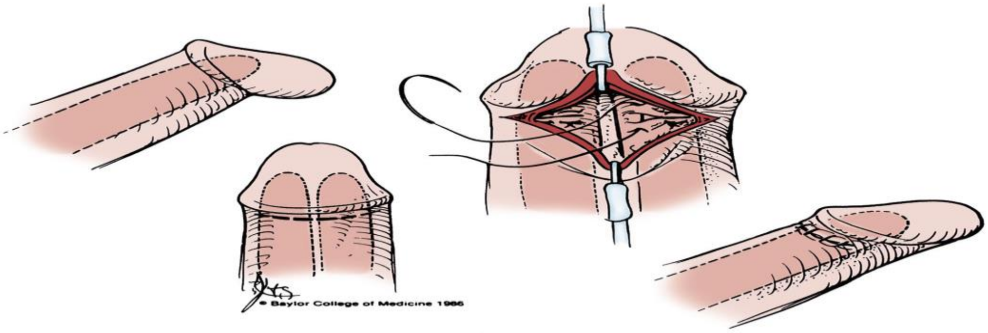
- avoid surgery in patients with UTI, skin infections in the operative field, etc
- shaving to be done just before surgery } use clipper not razor
- 10-min skin prep
- broad-spectrum Abx 1hr pre-op } eg Amp + Gent
- use of paper drapes not cloth drapes } less permeable to bacteria when wet
- use of Abx-coated device or submerse in Abx solution until insertion time
- good control of blood sugars

4) SST deformity } poor glans support ("concorde nose" appearance)

} from inadequate distal dilation, too short cylinders, or anatomic variations

Rx □ remove, perforate capsule distally, redilate, resize, insert longer cylinders (or same cylinders longer rear tips)

□ dorsal plication of glans back onto shaft of penis (for minor SST)



5) oversized cylinder or rod } usually complain of pain that doesn’t subside or presents with erosion into meatus or through glans

} may get sigmoid (S) deformities

Rx □ revision with reimplantation of smaller rods

6) pump migration } may migrate toward base of penis making use of pump difficult and also interfere with intromission

Rx □ revision may be necessary

7) auto-inflation } partial inflation with physical activity

Rx □ reduce risk by placing reservoir in retropubic /prevesical space and perform back pressure test

□ keep cylinders deflated during initial healing

8) mechanical failure } fluid leakage in inflatable devices

} **connector sites (most common)**

} cylinders (2nd most common)

} reservoir and pump (uncommon)

Rx □ revision (5-10% by 5-10yrs)

contraindications for immediate salvage of infected penile prosthetics

1) necrotic infections
2) rapidly developing infections
3) erosion of cylinders
4) visible pus
5) clinically unwell
6) severe DM
7) immunocompromised

PENILE PROSTHESIS IMPLANTATION IN SPECIAL CASES

ways to address penile curvature during prosthesis implantation for ED with concomitant Peyronie's disease

1) prosthesis insertion itself may produce adequate straightening
2) modeling or forcefully bending penis with cylinders inflated
3) corporoplasty
    - multiple relaxing incisions } if gap defect is >1cm, should cover to prevent herniation of cylinder (PTFE, porcine SIS, cadaveric pericardium, etc)

conditions are associated with cavernosal fibrosis

 makes dilation of corpora very difficult

1) post-removal of infected penile prosthesis
2) ED from ischemic priapism

Rx dilation with Metz not Hegar dilators

 extended corporotomies } permits more controlled dilation +/- resection of fibrotic contents of corpus cavernosum

RESULTS

successful of inflatable penile prostheses

- durability } 80-90% at 5yrs without mechanical failure
- patient satisfaction } ~80% satisfaction
- partner satisfaction } ~70% satisfaction
- compared to other Rx } better erectile function and increased sexual activity compared to PDE5 inhibitors and ICI Rx

Vascular Surgery for ED

goals of vascular ED surgery

- arterial } goal is to bypass obstructive arterial lesions in internal iliac-cavernosal arterial bed to increase cavernosal arterial perfusion in a pt with pure arterial insufficiency
  } **must have no end-organ disease**
- venous } goal is to decrease venous runoff in patients with pure venogenic ED
  } must have no end-organ disease

COUNSELING OF THE PATIENT FOR VASCULAR ED SURGERY

different incision sites for vascular ED surgery

- semicircular incision on one side at base of penis } access to penile shaft & infrapubic region
- paramedian or transverse abdominal incision } exposure to inferior epigastric vessels
- midline abdominal incision } access to bilateral inferior epigastric vessels and penile shaft

PENILE ARTERIAL RECONSTRUCTION (PENILE REVASCULARIZATION)

ideal candidate for microvascular arterial bypass surgery

- young & psychologically stable
- no vascular RFs } DM, HTN, CAD, smoker
- hx of blunt perineal or pelvic trauma } obvious recollection or probable occurrence of event
- has considered conservative Rx } responds to low-dose injections w/ a sustained, relatively rigid erection
- highly motivated for natural, spontaneous, rigid sustained erections without "assistance"
- failure to fill ED pattern
- reduced erectile spontaneity and rigidity

- variable sustaining capability (normal or better in AM)
- normal libido, ejaculation, orgasm and penile sensation
- normal penile geometry (flaccid and erect penile diameter-to-length ratio)
- normal penile extensibility during stretching
- no Peyronie’s plaques, intracavernosal masses, or nodules
- no sensory neuropathy

□ should have demonstrated functional arterial disease, based on 2nd phase DICC & doppler U/S

  □ gradient >30 mmHg between penile occlusion pressure and mean brachial pressure

  □ PSV <25 cm/sec in corporal penile arteries

tests are used prior to vascular ED surgery

1) common iliac arteriogram
2) selective internal pudendal arteriogram

□ identify focal lesion in artery/arteries supplying corpora cavernosa

□ assess adequacy of proposed donor artery (eg inferior epigastric artery) and proposed recipient artery (eg branch of dorsal penile artery)

donor arteries used for vascular ED surgery

□ microvascular surgery (endothelium preservation)

□ inflow

  1) inferior epigastric artery

  2) reversed saphenous vein connected to superficial femoral artery

□ outflow

  1) **to dorsal penile artery (or branch)**

    □ modified Michal

    □ end-to-side or end-to-end

    □ can preserve fundiform & suspensory ligaments

  2) to isolated segment of deep dorsal vein that has good communicators to intracavernosal tissue

    □ modified Virag

        - end-to-end
        - usually need to cut fundiform & suspensory ligaments (risk of penile shortening)
    3) dorsal vein-penile artery fistula (Hauri)

main points of penile revascularization surgery for ED

- pre-op Ancef solution for sterlization
- supine with legs slightly abducted
- shave abdomen and genitalia prior to prep and drape
- sterile Foley placement
- have hand-held Doppler, papaverine, and phenylephrine available
- 2 common incisions
    - midline incision (umbilicus to base of penis)
        - exposure for both inferior epigastrics & exposure to penile shaft
    - semicircular incision at one side of base + paramedian abdominal incision on other side
        - proximal and distal exposure of penile NVB, preservation of fundiform & suspensory ligaments, no scars on penis
- skin and dartos layer stripped away from penile shaft
- identify and expose L and R dorsal penile arteries and the deep dorsal vein in between
    - dorsal nerves are lateral to dorsal penile arteries
- isolate and harvest inferior epigastric artery on undersurface of rectus muscle
    - take with surrounding veins and fat en bloc to preserve vasa vasorum
    - dissect to origin at level of external iliac artery
- pass inferior epigastric artery through inguinal canal to the base of the penis
    - inspect origin of inferior epigastric for kinking or twisting
- abdominal incision closed (fascia + skin)
- 3 common anastomoses with 10-0 suture

        □ dorsal penile artery
        □ deep dorsal vein
        □ dorsal vein-penile artery fistula
- check flow with Doppler
- +/- placement of drain
- closure of inguino-scrotal incision (dartos + skin)

complications following penile revascularization

- penile edema } common
- hematoma
- penile numbness (hypoesthesia)
- penile shortening (20%) } scar entrapment - more common if fundiform/suspensory ligaments cut
  } may need scar release surgery
- mechanical disruption of anastomosis + hemorrhage
- glans hyperemia } from deep dorsal vein arterialization
  } occurs if communicating vein from deep dorsal vein to glans in distal dissection is missed

success rates of penile revascularization surgery

- 30-90% success

□ failure often related to presence of “end-organ” disease or poor outflow/run-off

PENILE VENOUS SURGERY

required parameters prior to penile VENOUS surgery

- complaint of short-duration erections or tumescence only with sexual stimulation
- failure of PDE5I’s or ICI
- normal cavernous arteries on 2nd phase of DICC or Doppler U/S
- faulty veno-occlusive mechanism determined by infusion pump or gravity pharmacocavernosometry that is amenable to surgery (no massive leakage)
- location of site of venous leak from corpora cavernosa on pharmacocavernosography
- no medical contraindication to Sx
- complete elimination of smoking
- selection on presentation of alternative choices in presence of long-term success rate of 40-50%

□ goal is a thorough complete penile vein dissection and ligation

main points of penile venous surgery

- supine or dorsal lithotomy position
- sterile Foley placement
- semicircular peripenile incision
- entire penis inverted into wound
- **communicating veins between deep and superficial systems are ligated**
- indigo carmine injected into corpora cavernosa } helps demarcate draining cavernosal veins
- release of fundiform and suspensory ligament in infrapubic region
- **ligation of deep dorsal vein in midpenile shaft**
- direct communicators and communicators from circumflex veins ligated
- cavernosometry
  - □ to produce an erection
  - □ to demonstrate adequate veno-occlusion has been obtained
- reapproximate suspensory ligaments
- drain placed in infrapubic region & close skin

complications following penile venous surgery as before

- immediate
  - penile and scrotal bruising
  - penile edema
  - pain from nocturnal erections
  - wound infection
  - hematoma
- long-term
  - penile shortening } 20-30%
  - penile numbness (hypoesthesia)
  - penile tethering from wound scar contraction

success rates of penile venous surgery

- long term results (<1yr) show success of ~25%